across it; one would have thought that this could have been avoided.

Of English contributors to earth-knowledge at this time there were very few. The wonderful Oxford philosopher, Roger Bacon (to whom Alma Mater ought to put up a statue) certainly knew more about the world than most of us are accustomed to think was known in his time, and was remarkably up to date in his information (pp. 500–507), but there were no others like him, nor were any of our sailors or chapmen discoverers like the men of Genoa or Venice. They were pirates who could gain victories over "Espagnols-sur-mer," but no more. Maundeville, alas, is now well known to be a fraud. He never existed but in the perverse brain of a Liégois clerk, John à-Beard, who concocted his tales of "Anthropophagi, and men with heads beneath their shoulders," from the true stories of contemporary travellers and many an antick tale drest up anew. The supposed English "discovery" of Madeira about 1370 by Machin is probably a myth (p. 441). Edward I.'s embassy to the Ilkhan Arghun of Persia in 1291–3 under Geoffrey of Langley (Galfridus de Langele) is interesting, but the ambassador went under Genoese guidance, and the English were out of their element in those parts. A century later an English constable of Guisnes and his secretary took a jaunt to Egypt and the Holy Places, and were no doubt grievously fleeced by the "magnus" and the "alius drugemannus," and the usual crowd of guides, donkey-boys, and camel-drivers and other demanders of *bakhshîsh,* much as their descendants might now be. But they saw a giraffe, and no doubt that was worth the money. The trip cost each pilgrim about 250*l.* in modern value. Such tours were not uncommon at the time: Mr. Beazley mentions some Germans; an active knight who ran out to Jerusalem and back in less than the space of one year, and another, William of Boldensel, who travelled in great state, and was so mighty and great that none dared trouble him for impost or dues of any kind wherever he went. There was also that amusing pedant the Rector of Sudheim, who consorted with none but kings and nobles the whole time he was away, and when he got back no doubt bored the good folk of his Westphalian village to death with them for the rest of his life.

Another German, Schiltberger, was no Boldensel or Ludolf; he consorted with kings, it is true, but as their slave. Captured at Nicopolis, he was the bondman of Bajazet the Turk, and was by the fortune of battle transferred to the servitude of Timur the Tartar. Only after many years of slavery did he escape to his native Germany again. His account of the lands in which he lived so many years, from Egypt to Siberia, is naturally of the greatest value; we wish only that he had told us more. He was but an unlettered warrior.

Of the rule of the second Tartar Empire we have further knowledge from an unexpected source. Of Catalan mercantile activity we have already spoken. The Castillian rivals of Aragon were no traders, and their first contribution to geographical knowledge was due to an embassy to the East like that of the Englishman Langley, but more than a century after his time. In 1403 King Henry of Castille dispatched the noble hidalgo Don Ruy Gonzalez de Clavijo as his envoy to Timur the Tartar, Tamerlane the Great himself, and Mr. Beazley tells us of the terrible journey of the Spanish envoys, across the uninhabited wastes which the terrible tyrant had made, to his court at Samarkand, of what they saw when at last they got there, and how they left on their return shortly before the conqueror set out on his endeavour to rival Genghis and conquer China, only to die a few stages out of his capital (1405).

In Spain at this time the Moslem kingdom of Granada still existed, shorn of its ancient glory both in war and in science. But Moslems still contributed to the increase of geographical knowledge, and one, from the neighbouring Morocco, was second to none as a traveller and recorder of his travels. This was the wonderful Shêkh Ibn Batûta of Fez, who in the fourteenth century traversed the greater part of the known world, from Peking to Timbuktu, and wrote an account of his travels which, as might indeed have been expected, shows far greater intelligence than most Frankish records of his time. We wish that Mr. Beazley had written more about the Moslem geographers. Yakut is dismissed in three lines (p. 534); Edrisi, in spite of his relations with the Franks of Sicily, has but two pages. It is not enough.

Space forbids further account of the interesting things in Mr. Beazley's last volume. In it there are singularly few misprints, and the author has evidently submitted his Oriental names to the scrutiny of someone familiar with Arabic and Syriac. We have no more "Jesus Jabuses" or "Mar Jabalabas" in this volume, though "Nujmuddin" for the name of an Egyptian sultan is hardly pretty; let us give this "Star of the Faith" his hard Egyptian *gîm,* and call him Nigm-ud-dîn.

The long-needed index has appeared in the last volume, and with its completion let us cordially congratulate Mr. Beazley on the achievement of his work, which is a credit both to him and to his University.

SIR MICHAEL FOSTER, K.C.B., F.R.S.

FIFTY years ago the science of physiology, as now understood, was scarcely recognised. It began in England when the early anatomists added an account of the uses or actions of the several muscles, glands, and viscera to the account of their form and structure. So in the sixteenth and seventeenth centuries each anatomical description was followed by the word *Usus.* True, experiments were practised from the time of Vesalius downward, by Harvey himself, by Redi, and by the Rev. Stephen Hales, and often with brilliant success. The problems of the circulation, of spontaneous generation, and of blood-pressure in the arteries were solved by these admirable experimenters; but their efforts were isolated. Fifty years ago we had in England excellent observers with the microscope, particularly Sharpey and Bowman; but there was no systematic study of the working of the human machine by masters like Johannes Müller, Ludwig and Claude Bernard, and "practical physiology" consisted in little more than examining the tissues under the microscope and exhibiting a few chemical reactions of animal fluids.

The first attempt to teach the new physiology in England is due to Dr. Gamgee, who translated the fifth edition of Hermann's famous text-book. About the same time a scientific physician in London gave up practice for the sake of investigating healthy and morbid functions of plants and animals, as well as man; and a few years later a young country surgeon who had already given hostages to fortune by a wife and two children persuaded his father to let him leave Huntingdon and adopt the fortunes of a teacher of physiology. Dr Burdon-Sanderson from Edinburgh, and Dr. Michael Foster from Huntingdon, taught, the one pathology (human, animal and vegetable), the other histology and "the use of the microscope." Both were tall in stature and striking in appearance; both made their mark in the practical application of biology to the health of men and animals; both migrated from University College, London, Sanderson to Oxford, and Foster to Cambridge, in order to introduce the modern science of biology into the curriculum of the older universities. Sanderson died somewhat earlier; Foster has only just been removed.

It is still too early to decide on the extent and permanent value of Foster's work, but some estimate of it may be attempted.

His strongest point was force of character, energy perseverance, thoroughness. He expected his pupils to work as hard as he did, and to regard scientific investigation as the most honourable and delightful pursuit. He had the rare faculty of discovering talent in pupils and giving it concentration and method. He set them problems to solve, and as soon as they had shown their capacity to work alone, he left them to plant the seed in another virgin soil. Foster's success at Cambridge was remarkable, both in the number of those who took up serious study in the laboratory and in the great eminence achieved by very many. His greatest merit is that, like Ludwig, he created in his disciples the noble ambition to increase knowledge, and was content to see the result and to applaud. Some of his pupils have made themselves a European reputation, others have carried Foster's methods and enthusiasm into botany, pathology, public health, and medicine.

Foster early acquired an excellent style for scientific writing. Probably Huxley's lectures and writings pleased him first, but however Foster's style was acquired, he at last attained the state which Hazlitt asserted (not without reason) he had reached when it was less trouble to write well than to write ill.

The child's "lessons" in physiology were as well composed and expressed as the famous "text-book" (1876) and the "History of Physiology" (1900).[1]

He soon gathered together his first band of disciples among them Francis Balfour, whose brilliant career was sadly ended by an accident on the Alps; Langley, who succeeded him at Cambridge; Gaskell, Sherrington, Adami, Sedgwick, L. E. Shore, F. G. Hopkins—these are only some of the names of men who owed their first step in scientific investigation to Foster's inspiration, and remained his cordial friends to the last.

As soon as he had taught the elements of practical research in physiology, he encouraged his pupils to work out their own vein, whether the task first set them was completely finished or not. Whatever other academical differences he encountered, Foster never failed in the support of his old pupils.

Apart from his lectures and his books, Foster threw himself heartily into the duties which his position as secretary of the Royal Society entailed. He held the office from 1881 to 1903 under the presidency of Spottiswoode, Huxley, Stokes, Kelvin, Lister, and Huggins. He did much to stimulate interest in the biological side of the society.

Foster was a well-known official of the British Association, and was president at Dover in 1897, when he was made a K.C.B. He spoke only to begin or reinforce the discussion. On the council his influence was powerful, and was never used for private ends. At the annual dinner of the society Foster only spoke at intervals, and the task was always well performed. But his oratory at its best was to be heard at less formal meetings where ready wit and good-natured sallies were appropriate.

After his connection with Cambridge was severed, Foster found fresh occasion for serving science by his election as representative of the University of London in Parliament in succession to Sir John Lubbock, now Lord Avebury. His speeches in the House were few, and chiefly confined to subjects on which he could speak with authority—education, public health, fisheries, scientific experiments on animals, and similar cases of applied knowledge. He spoke slowly and distinctly, with a quiet emphasis which secured attention from both sides of the House. He entered Parliament as a Unionist and a supporter of the Boer War; but he found himself out of sympathy with Mr. Balfour's Government on financial policy and on popular education; he therefore sought first to resign, and afterwards to transfer his seat from the Unionist to the Liberal side. At the General Election he was defeated by a very small majority, and his seat is occupied by Sir Philip Magnus. In connection with his political career must be mentioned the important commissions on which Foster served—that on vaccination, of which the late Lord Herschell was chairman; that on the disposal of sewage; another on fisheries; and, perhaps the most important, one on tuberculosis in animals and man. The final report of this committee was signed by Foster only a few days before his death.

On the day before he was taken ill, at the meeting of the British Science Guild at the Mansion House, he spoke as follows:—"This meeting shows how widely science is entering into our lives; it has interwoven itself with our works, and is more and more guiding our ways. If we could imagine a world without science, we might address to that world the words which Dante addressed to Italy in the Middle Ages: 'Nave senza nocchiero in gran tempesta.' Nothing is more clear than that science is not for men of science alone. We, with our slight efforts, can lift great weights. We are a feeble folk, and if we can effect anything it is by pulling the long end of the lever, and it is because of the length of the lever that we are able to effect anything. Thus, with our slight efforts, we can lift great weights at present, and we shall lift heavier and heavier weights in the future if we have the support of the people, and the support of the Government bidden by the people. It is for the people to bid the Government, and the present Government perhaps above all other Governments, to help science; for they can give us the opportunities we are asking for to-day."

To Foster's personal charm no description can do justice. To old friends like Prof. Carey Foster or Mr. Coots Trotter he was always the same. On a dredging expedition where he and his mate managed the tackle in the intervals of sea-sickness, in a crowded Italian railway carriage, or receiving polyglot professors, Foster's voice always announced good humour, good temper, and good nature.

He delighted in his garden, and was said to cultivate physiology when not too busy with a new iris. Next to his own species he delighted in cats and dogs and flying birds. His early life between Huntingdon and Cambridge was one of struggle, and his later days, when he had lost his laboratory, were clouded by occasional ill-health; but, on the whole, his strenuous and active life was a happy one, for it exercised his great and varied abilities for worthy objects. He was a man greatly beloved, and he has left a deep memorial in the hearts of all who knew him best.

The funeral of Sir Michael Foster took place at Huntingdon on Saturday, among those present at the grave-side being Lady Foster, Dr. Michael G. Foster, Dr. R. Bradford, Sir Thomas Barlow, Dr. Pye Smith, Mr. Horace Darwin, Dr. Gaskell, Prof. Langley, and Prof. Sherrington. A memorial service was held on Saturday afternoon at St. James's Church, Piccadilly, and was attended by many leading men of science. The Royal Society, of which Sir Michael Foster was a secretary for twenty-two years, was represented by Lord Rayleigh, O.M., president; Prof. D. Ferrier, vice-president; Sir Archibald Geikie, secretary; Mr. R. Harrison, assistant secretary; and a large number of fellows of the society. Among those present were Lord Reay (president of the British Academy), Lord Monkswell, Sir William Crookes, Sir Philip Magnus, M.P., Sir Arthur Rücker (principal of the University of London) and Lady Rücker, Sir Norman and Lady Lockyer (British Science Guild), Major MacMahon (British Association), Sir William Ramsay, Sir Joseph Swan, Sir J. Crichton-Browne, Sir James Blyth, Prof. R. Meldola (president of the Chemical Society), Dr. Russell Wells, Prof. S. P. Thompson, Dr. E. Divers, Dr. J. Kingston Fowler (dean of the faculty of medicine at the University of London), Prof. Wyndham Dunstan, Prof. Tilden, Prof. Priebsch, Sir Alexander Pedler, Dr. Bashford, Prof. Thane, Prof. Starling, Dr. Hugo Müller, Prof. Emerson Reynolds, Sir Henry Howorth, Prof. McLeod, Sir H. Trueman Wood, Dr. Horace Brown, Prof. Judd, Prof. Hull, and Mr. Frederick Macmillan.

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[1] Even Foster's writings were not always free from oversights. In one passage he advises the reader to "get a firm hold of the most prominent feature of the subject"; in another he corrects a woodcut by explaining that the granules "have been rendered too bold by the artist."

A large and representative congregation also attended the memorial service held in Trinity College Chapel, Cambridge, of which college Sir Michael was a fellow. The congregation included the Vice-Chancellor (the Rev. E. S. Roberts, Master of Caius), Profs. Sir R. S. Ball, E. C. Clark, T. Clifford Allbutt, A. Macalister, A. R. Forsyth, Carey Foster, F. Howard Marsh, G. Sims Woodhead, H. Jackson, and A. C. Seward, Dr. W. N. Shaw, and the following representatives of learned societies:—University of Oxford, Prof. Poulton, Dr. Collier, Prof. Gotch; the Royal Society, Mr. A. B. Kempe (treasurer), Mr. F. Darwin (foreign secretary), and other councillors; University College, London, Prof. H. S. Foxwell; British Association, Sir George Darwin and Mr. A. E. Shipley; Cambridge Philosophical Society, Dr. Hobson (president) and Mr. H. F. Newall (treasurer); the Epidemiological Society of London, Dr. H. Timbrell Bulstrode; Manchester University, Prof. Lamb and Prof. Conway.

NOTES.

At the forthcoming meeting of the British Association in Leicester, the evening lectures will be by Mr. W. Duddell, on "The Arc and the Spark in Radio-telegraphy," and by Dr. F. A. Dixey, on "Recent Developments in the Theory of Mimicry." The lecture to the operative classes will be given by Prof. H. A. Miers, F.R.S., on "The Growth of a Crystal."

We notice with deep regret that Prof. D. I. Mendeléeff, the eminent Russian chemist, who was born seventy-three years ago to-day, died on February 2. Prof. Mendeléeff was the subject of a "Scientific Worthy" article in Nature of June 27, 1889 (vol. xl., p. 193), and we hope to supplement this next week with a short account of work accomplished by him since that date.

We learn from the *British Medical Journal* that the seventh International Congress of Physiology will be held this year at Heidelberg on August 13–16, under the presidency of Prof. August Kossel. In connection with the congress there will be an exhibition of scientific apparatus. Announcements of communications should be sent to the Physiological Institute, Heidelberg, before June 15.

A Reuter message from Melbourne on January 31 reports that slight shocks of earthquake have occurred at Eden, New South Wales, and at Gabo Island, off the coast of Victoria. Severe shocks were felt in north-eastern Tasmania on January 30. News has reached Melbourne that two severe and prolonged shocks were felt in the Tonga Islands on January 2.

Science announces that Dr. Otto Lummer, professor of experimental physics at Breslau, will begin a course of ten lectures at Columbia University on February 15. Prof. J. Larmor, Sec.R.S., will begin a course of six lectures on March 27. Mr. W. Bateson, F.R.S., will give the Silliman memorial lectures at Yale University next year. The preceding lecturers on this foundation have been Prof. J. J. Thomson, F.R.S., Prof. C. S. Sherrington, F.R.S., Prof. Ernest Rutherford, F.R.S., and Prof. W. Nernst.

On Tuesday next, February 12, Prof. W. Stirling will begin a course of six lectures at the Royal Institution on "The Visual Apparatus of Man and Animals"; on Thursday, February 14, Mr. A. Harker will give the first of two lectures on "The Minute Structures of Igneous Rocks and their Significance"; and on Saturday, February 16, Prof. J. J. Thomson will commence a course of six lectures on "Röntgen, Kathode, and Positive Rays." The Friday evening discourse on February 15 will be by Mr. J. J. Lister, on "Foraminifera."

A committee has been appointed by the Board of Treasury to inquire generally into the work now performed at the National Physical Laboratory, with special reference to the character of the tests undertaken there and the lines on which any further development of the work of the laboratory should proceed. The committee consists of Mr. G. W. Balfour, chairman, Sir Andrew Noble, Bart., K.C.B., F.R.S., Sir J. Wolfe Barry, K.C.B., F.R.S., Mr. W. J. Crossley, M.P., and Mr. R. Chalmers, C.B. Mr. G. C. Upcott, of the Treasury, will act as secretary to the committee.

Upon the authority of the *Figaro*, the Paris correspondant of the *Times* reports that M. Daniel Osiris has left by his will a sum of one million sterling to the Pasteur Institute. The bequest by which the Pasteur Institute thus benefits will provide it with an annual income of from 30,000*l.* to 40,000*l.* It is already one of the best endowed scientific institutions in the world, and this princely gift will enable it to organise on a practical basis a large number of new branch establishments for scientific research all over France and in the French colonies.

Colonel John Mercer Brooke, whose death in his eightieth year was recently announced, was best known as the inventor of a deep-sea sounding apparatus which was subsequently superseded by that of Lord Kelvin. During the American Civil War, Colonel Brooke, along with Maury, the distinguished hydrographer, associated himself with the seceding States, and was successful in effecting many improvements in the cannon of the time. At the close of the war he was appointed a professor in the Virginia Military Institute at Lexington, and held the chair of physics and astronomy until 1899. In the years preceding the Civil War, he was engaged in making hydrographic surveys in the Pacific Ocean, particularly in the archipelago and along the coasts of China and Japan.

A recent Reuter message from Entebbe shows that the new Commissioner of Uganda is making vigorous efforts to combat the scourge of sleeping sickness. Acting upon the discoveries made by the Royal Society's commission with regard to the transmission of the disease by the local species of tsetse-fly, it is sought to render the fly innocuous by preventing it from becoming infected with the micro-organism (Trypanosoma) which causes the disease. With this end in view the natives are being removed from the